Claims:

1. A process for making angstrom scale flakes comprising:

providing a vacuum deposition chamber containing a deposition surface;

providing a release coat source and a flake material deposition source in the vacuum deposition chamber, each directed toward the deposition surface;

depositing on the deposition surface under vacuum alternating layers of a vaporized polymeric release coat layer and a vapor deposited flake layer from the release coat source and the flake material deposition source, respectively, to build up in sequence a multi-layer stack of flake material layers separated by and deposited on corresponding intervening release coat layers;

the release coat layers comprising a thermoplastic polymeric material dissolvable in an organic solvent and which, when vaporized under vacuum, forms a smooth continuous barrier layer and support surface on which each of the flake material layers is formed;

the flake material layers comprising a vapor-deposited material applied to a film thickness of from about 5 to about 500 Angstroms; and

removing the multi-layer stack from the vacuum chamber and separating it into flakes by treatment with an organic solvent which dissolves the release coat layers and yields single layer flakes which are essentially free of the release coat material.

2. The process according to claim 1 in which the release and flake material layers are applied to a chilled rotating drum.

3. The process according to claim 1 in which the release coat material includes a lightly cross-linked polymeric material with weak bond strength or a polymeric material which has been polymerized by chain extension.

4. The process according to claim 1 in which the release coat material has a glass transition temperature sufficiently high so that the heat of condensation of the deposited metal layer will not melt the previously deposited release layer.

5. The process according to claim 1 in which the release coat material is selected from styrene or acrylic polymers or blends thereof.

6. The process according to claim 1 in which the layer of flake material comprises a metal layer selected from the group consisting of aluminum, copper, silver, chromium, tin, zinc, indium and nichrome.

7. The process according to claim 6 in which the optical density of the vapor deposited metal layer is in the range of about 0.5 to about 2.8 (MacBeth densitometer).

8. The process according to claim 1 in which the release coat layer has a thickness in the range of about 200 to about 400 angstroms.

9. The process according to claim 1 in which the metal flakes have an aspect ratio of 300 or more.

10. The process according to claim 1 in which the flake material comprises an inorganic material.

11. A process for making angstrom scale metal flakes comprising:

providing a vacuum deposition chamber containing a deposition surface;

providing a release coat source and a metal deposition source in the vacuum deposition chamber, each directed toward the deposition surface;

depositing on the deposition surface under vacuum alternating layers of a vaporized polymeric release coat layer and a vapor deposited metal layer from the release coat source and the metal deposition source, respectively, to build up in sequence a multi-layer stack of metal layers separated by and deposited on corresponding intervening release coat layers;

the release coat layers comprising a thermoplastic polymeric material which is dissolvable in an organic solvent and which, when vaporized under vacuum, forms a smooth continuous barrier layer and support surface on which each of the reflective metal layers is formed;

the reflective metal layers comprising vapor-deposited aluminum in elemental form applied to a film thickness from about 5 to about 500 Angstroms; and

removing the multi-layer stack from the vacuum chamber and separating it into metal flakes by treatment with an organic solvent which dissolves the release coat layers and yields single layer flakes having surfaces essentially free of the release coat material.

12. The process according to claim 10 in which the release coat material comprises polystyrene or acrylic resin or blends thereof.

13. A process for making angstrom scale multi-layer reflective metal flakes with protective outer coatings comprising:

providing a vacuum deposition chamber containing a deposition surface;

providing a release coat vapor deposition source, a metal vapor deposition source and a protective coating vapor deposition source in the vacuum deposition chamber, each directed toward the deposition surface;

vapor depositing on the deposition surface under vacuum, in the following sequence, (1) a layer of release coat material from the release coat vapor deposition source, (2) a first protective outer coating from the protective coating vapor deposition source, (3) a reflective metal layer from the metal vapor deposition source, (4) a second protective coating from the protective outer coating vapor deposition source, and (5) a further layer of a release coat material from the release coat vapor deposition source, to build-up in sequence a stack of multi-layer flake material comprising metal layers each bonded to first and second protective outer coatings with intervening release coat layers between adjacent layers of multi-layer flake material;

the release coat layers comprising thermoplastic polymeric material which is dissolvable in an organic solvent and which, when vaporized under vacuum, forms a smooth continuous barrier layer and support surface on which each layer of multi-layer flake material is formed;

the reflective metal layers comprising vapor-deposited metal in elemental form applied to a film thickness from about 10 to about 2000 Angstroms; and

removing the stacks of multi-layer flake material from the vacuum chamber and separating them into flakes by treatment with an organic solvent which dissolves the release coat layers and yields multi-layer flakes comprising metal layers bonded on opposite sides to the first and second protective outer layers, the flakes having their surfaces essentially free of the release coat material.

14. The process according to claim 13 in which the protective outer coating comprises a transparent polymeric material applied from its corresponding vapor deposition source and cured in the vacuum chamber to a thermoset condition.

15. The process according to claim 13 in which the protective outer coating comprises a vapor deposited inorganic material selected from the group consisting of magnesium fluoride, silicon monoxide, silicon dioxide, aluminum oxide, aluminum fluoride, indium tin oxide, titanium dioxide, and zinc sulfide.

16. The process according to claim 13 in which the multi-layer flakes are selected from the group consisting of inorganic/metal or alloy/inorganic, metal/inorganic/metal, and crop-linked polymer outer layers on metal or alloy.

17. A process for making angstrom scale flakes comprising:

providing a vacuum deposition chamber containing a deposition surface;

providing a release coat source and an inorganic flake material deposition source in the vacuum deposition chamber, each directed toward the deposition surface;

depositing on the deposition surface under vacuum alternating layers of a vaporized polymeric release coat layer and a vapor deposited inorganic flake material from the release coat source and the flake material deposition source, respectively, to build up in sequence a multi-

layer stack of inorganic flake material separated by and deposited on corresponding intervening release coat layers;

the release coat layers comprising a thermoplastic polymeric material dissolvable in an organic solvent and which, when vaporized under vacuum, forms a smooth continuous barrier layer and support surface on which each of the inorganic flake material layers is formed;

the inorganic flake material layers comprising a vapor-deposited inorganic material having a thickness in the range of about 5 to about 500 angstroms, and in which the inorganic material is selected from the group consisting of magnesium fluoride, silicon monoxide, silicon dioxide, aluminum oxide, aluminum fluoride, indium tin oxide, titanium dioxide and zinc sulfide; and

removing the multi-layer stack from the vacuum chamber and separating it into flakes of inorganic material by treatment with an organic solvent which dissolves the release coat layers and yields single layer flakes of inorganic material essentially free of the release coat material.

18. A process for making angstrom scale particles, comprising:

providing a vacuum deposition chamber containing a deposition surface;

providing a release coat deposition source and a particle deposition source in the vacuum deposition chamber;

depositing on the deposition surface a vaporized polymeric release coat layer from the release coat deposition source, the release coat layer comprising a thermoplastic polymeric material dissolvable in an organic solvent and which, when vaporized under vacuum, forms a smooth continuous support surface on which a layer of particle material can be vapor deposited;

vapor depositing on the release coat surface a discontinuous layer of particle material to form discrete islands of angstrom scale particle material; and

removing the particle material by treating it and the release coat layer with organic solvent to dissolve the release coat material and produce discrete angstrom scale particles essentially free of release coat material.